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Registry of non-native species in the Two Seas region countries (Great Britain, France, Belgium and the Netherlands)

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Abstract

This dataset represents a registry of species that are not native but recorded to live in the wild of at least one of the four countries that comprise the Two Seas Area, i.e. Great Britain, France, Belgium and the Netherlands. For each of the 6,661 species, subspecies and hybrids listed, we provide detailed information on its status in each country, taxonomic affiliation and environment inhabited. The data were collected by review of 36 web- and print-based sources over an eight-month period. Further systematic scanning of three of the most relevant scientific journals, i.e. Neobiota, Aquatic Invasions and BioInvasions Records, recovered 19 additional relevant publications from which information was included in the registry. As a result, the registry will serve as a basis for developing effective, cross-boundary strategies to manage and control non-native species, which can have severe ecological and economic impacts. The registry can further be used as a general reference for both scientists and practitioners, as well as a tool to assess reliability and comprehensiveness of other well-known databases such as the DAISIE portal.

Keywords

Belgium, English Channel, exotic species, France, Great Britain, invasive species, Netherlands

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Definition of terms

Native species	Refers to a species that has been observed in the form of a naturally occurring and self-sustaining population in historical times.
Non-native species (NS)	Refers to a species that has been introduced through human action outside its natural present or historical range. This term includes species whose main pathway of introduction is human-related although they have entered a country through natural spread from one or more neighbouring countries. However the term excludes species expanding their range without direct human action, as in the case of migration or species expanding because of climate change or habitat modification, even if these changes are caused by humans.
Invasive non-native species (INS)	Refers to a non-native species that adversely affects the regions and habitats it invades environmentally, economically and/or ecologically. This term therefore excludes non-native species that do not pose any significant threat to biodiversity conservation.

Introduction

The region comprising the British Channel and southern part of the North Sea, as well as coastal areas of Great Britain, France, Belgium and The Netherlands (also referred to as The Two Seas region) has a long history of trade and travel, and includes important commercial ports such as Southampton, Felixstowe, Le Havre, Antwerp and Rotterdam ("World Shipping Council. Top 50 World Container Ports" ; Enshaei and Mesbahi 2009). These intensive activities across national borders have led to the introduction of numerous exotic animal, plant and other species to this area, both from other European regions and further afield (Holdich and Pöckl 2007; Gherardi et al. 2009; Keller et al. 2009).

Invasive species do not know political borders, which is why cooperation and collaboration between countries is key in the fight against devastating and costly non-native, invasive species. Efficient cross-border communication and knowledge transfer would guarantee that knowledge on the vectors, impacts and control options for non-native species gained in one country informs decisions on management and control for non-native species in other countries. It can further help to raise the alarm on species that are likely to spread from one country to another, prompting preventive action plans. International cooperation in environmental politics can facilitate development and implementation of sustainable cross-border management practices for non-native species (Essl et al. 2011).

Examples exist where international cooperation has significantly improved the prevention of non-native species' spread. These include the Inter-American Invasive Species Network (IABIN-13N, http://i3n.iabin.net/) that supports the detection and management of invasive alien species in the Americas, and the Trilateral Committee for Wildlife and Ecosystem Conservation and Management (http://www.trilat.org), which addresses environmental challenges common to Canada, United States and Mexico (Simpson et al. 2006; Simpson et al. 2009).

With regard to the Two Seas region, the European-funded 'Interreg Two Seas Programme' promotes cross-border cooperation between Great Britain, France, Belgium and The Netherlands (see http://www.interreg4a-2mers.eu for more information). Within this initiative, the RINSE (Reducing the Impacts of Non-native Species in Europe) project aims to develop cross-border tools to improve the prioritisation and targeting of non-native species. As a minimum requirement, such a regional approach to invasive species' management requires an up-to-date and comprehensive registry of non-native species containing information on the current status of each non-native species in each of the four Two Seas region countries. To facilitate application in reliable horizon-scanning and similar exercises, and allow for meaningful comparisons of inventories between countries and taxa, it is crucial that this database is as comprehensive as possible but not skewed towards particular countries or taxa.

Unfortunately, currently available databases are unsuitable for such a purpose. For example, the number of species listed in freely accessible online databases differs considerably between databases as well as between the four countries of concern. Thus, the primary data portal for non-native species in Europe, DAISIE (Delivering Alien Invasive Species Inventories for Europe; http://www.europe-aliens.org/), features 2,471 non-native species for Belgium, 2,075 of which are terrestrial plants, but only 881 species for the slightly larger Netherlands. In contrast, the Dutch Biodiversity registry (http://www.nederlandsesoorten.nl) lists 925 non-native species, and only 101 invasive non-natives are highlighted by the Belgian information system Harmonia (http://ias.biodiversity.be). The Great Britain Invasive Non-Native Species Secretariat (NNSS) database (http://www.nonnativespecies.org) comprises over 3,000 species. No comparable initiatives exist in France. Such enormous discrepancies between inventories of neighbouring countries that would be expected to host comparable numbers and sets of non-native species are unlikely to be real but probably root in different experts providing the data for different countries and databases.

The present dataset aims at providing a registry of non-native species in the Two Seas region that is comprehensive and not biased towards particular countries or taxa. We achieve this by integrating information from a total of 55 national and international print- and online-sources on the presence of non-native terrestrial, marine and freshwater species in the four Two Seas region countries. In addition, for each taxon, the registry provides information on its taxonomic classification, current distribution and environment inhabited. Potential utilities of this registry include developing national checklists of non-native species, and analysing spatial patterns of distribution of species. Furthermore, the database offers a general point of reference for both scientists and practitioners working on non-natives in the Two Seas region and adjacent countries. Finally, the registry could act as a tool to assess reliability and comprehensiveness of other databases from which data was retrieved. This could be done by, for example, comparing number and identities of non-native species listed by a given source database to those of the present registry.

Metadata

Data set descriptors

A. Data set identity

Registry of non-native species in the Two Seas region countries (Great Britain, France, Belgium and the Netherlands)

B. Data set description

The dataset consists of 1 file, containing two worksheets. Worksheet "Registry" contains a 10 × 6,662 matrix of text values, Worksheet "Summary of data" contains three summarising tables in the form of three 2 × 33, 2 × 5 and 8 × 5 matrices of text and numeric values. The file is labelled as Table_RegistryNonNativeSpecies.xls

1. Principal investigators

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Research origin descriptors

A. Overall project description

1. Identity

We collected information on the status of non-native species in each of the four countries Great Britain, France, Belgium and the Netherlands. The taxonomic affiliation and environment inhabited by each species is also provided.

2. Originators

The project was conducted within and on behalf of the European Union funded RINSE (Reducing the Impacts of Non-native Species in Europe) Project. Methodology was developed by the three authors Alexandra Zieritz, Belinda Gallardo and David C. Aldridge. Data collection was done by Alexandra Zieritz and Belinda Gallardo.

3. Period of study

Data was collected from 01/06/2012 to 27/02/2014. Collected data correspond to contemporary species records.

4. Objectives

The primary objective of the present work was to compile a registry of non-native species present in the four countries comprising the Two Seas region, i.e. the English Channel and the Southern part of the North Sea. The registry will serve as a basis for developing effective, cross-boundary strategies to manage and control non-native species, which can have severe ecological and economic impacts. It can further be used as a general reference for both scientists and practitioners, as well as a tool to assess reliability and comprehensiveness of other well-known databases such as the DAISIE portal.

5. Source of funding

INTERREG IVA 2-Seas Programme. Funded by the European Regional Development Fund (ERDF).

Project: RINSE, Reducing the Impacts of Non-Native species in Europe.

Work Package 1 subproject: Targeting and Prioritisation for Non-Native species into the RINSE area.

Summary of the RINSE project

RINSE (Reducing the Impacts of Non-native Species in Europe) is a European Project which investigates best strategies of managing non-native species (NS) across the Two Seas Programme area. The project specifically aims to i) develop cross-border tools to improve prioritisation and targeting of NS, so that scarce resources can be directed towards the species and sites of greatest concern, ii) enhance the capacity to address NS within a range of target stakeholders, and iii) develop new approaches and best practices for the management of NS, by delivering field trials and demonstration projects. RINSE works across borders to share best practice and adopt strategic approaches to tackle the threats posed by non-native species (NS).

B. Specific subproject description

1. Site description.

a. Site type

The region includes terrestrial, marine and freshwater habitats.

b. Geography Location

Countries comprising the Two Seas Programme area (i.e. the English Channel and the Southern part of the North Sea): Great Britain, France, Belgium and The Netherlands.

c. Habitat

The region includes terrestrial, marine and freshwater habitats.

d. Geology, landform

The region includes various geological types, ranging from Pre-Cambrian, to Carboniferous, Cretaceous and Tertiary rocks.

e. Watersheds, hydrology

The main river systems in the area include the Thames, Loire, Seine, Meuse and Rhine.

f. Climate

Climatic conditions in the study area range from Mediterranean (i.e. Southern France) to temperate.

2. Experimental or sampling design

a. Design characteristics

Basic data were collected by systematic review of 36 web- and print-based sources over an eight-month period (see Table 1). Additional systematic scanning of three scientific journals, i.e. Neobiota, Aquatic Invasions and BioInvasions Records, recovered 19 additional relevant publications from which information was included in the registry.

b. Data collection period, frequency, etc.

Basic data collection period was 01/06/2012 to 17/01/2013. Additional systematic scanning of the three journals Neobiota, Aquatic Invasions and BioInvasions Records was performed in January and February 2014.

3. Research methods

A number of online and print data sources were used to obtain information on non-native species present in the four Two Seas region countries. In total, the basic data were gathered from 36 sources, including the 12 listed in detail in Table 1 used for all animal phyla and plant divisions, and additional references for particular groups of organisms (see references). Selection of the databases included in this work was done with the help of consulting experts within the European RINSE (Reducing the Impacts of Non-native Species in Europe) project.

Particular care was thereby taken to avoid and counteract any bias towards particular countries. For example, the lack of a national database on non-native species in France was targeted by inclusion of an additional 11 grey-literature sources from France, which we obtained through our local RINSE partners ("Le Conservatoire Botanique National de Bailleul. Liste des plantes exotiques considérées comme envahissantes en Picardie"; Agence de l'eau Artois Picardie and Conservatoire Botanique National de Bailleul 2005; Agence de l'eau Rhin Meuse 2005; Costa 2005; Delbart et al. 2007; Conseil General du Finistere 2008; Lacroix et al. 2008; Paradis et al. 2008; Zambettakis and Magnanon 2008; Reseau regional des Gestionnaires des Milieux Aquatiques Paca 2009; Hudin and Vahrameev 2010).

Table 1. The main 12 web- and print-based sources per taxa used for compiling the registry of non-native species in the Two Seas region countries Great Britain, France, Belgium and the Netherlands.

Acronyms and abbreviations of online databases: "DAISIE - Delivering Alien Invasive Species Inventories for Europe", "ISSG - Invasive Species Specialist Group. Global Invasive Species Database", "CABI - Centre for Agricultural Bioscience International. Invasive Species Compendium. Wallingford, UK: CAB International", "FAO - Food and Agriculture Organisation (United Nations). Fisheries and Aquaculture topics. Introduction of species. Database on Introductions of Aquatic Species. In: FAO Fisheries and Aquaculture Department. Rome", "NOBANIS - North European and Baltic Network on Invasive Alien Species. Gateway to Information on Invasive Alien species in North and Central Europe", "NNSS - GB Non-native Species Secretariat. GB Non-native Species Information Portal", "BFIS - Belgian Forum on Invasive Species. Harmonia database", "Waarnemingen. Belgian daughter website of the Global Biodiversity Recording Project", "Waarneming. Dutch daughter website of the Global Biodiversity Recording Project", "Naturalis. Nederlands Soortenregister, version 2.0", "BFIS - Belgian Forum on Invasive Species. Harmonia database"

Other abbreviations: na, not applicable because no data on presence of species within the respective phylum/division in the four countries were available from this source; N, source not used with regard to respective phylum/division; Y, all taxa of respective phylum that this source lists to be present in one or more of the four countries were included; Y ex T, all taxa except terrestrial ones of respective phylum that this source lists to be present in one or more of the four countries were included.

	Phylum	DAISIE	ISSG	CABI	FAO	NOBANIS	NNSS	Waarnemingen	Waarneming	Naturalis	BFIS	Gollasch et al. (2009)	Wolff (2005)
Viruses, Bacteria, Protista	Viruses	na	na	Y	na	na	Y	na	na	N	na	na	na
	Firmicutes	na	na	na	na	na	Y	na	na	N	na	na	na
	Proteobacteria	na	Y	Y	na	na	na	na	na	N	na	na	na
	Cercozoa	Y	na	na	na	na	Y	na	na	N	na	Y	Y
Algae	Dinoflagellata	Y	na	na	na	na	Y	Y	Y	N	na	Y	Y
	Haptophyta	Y	na	na	na	na	Y	Y	Y	N	na	Y	na
	Heterokontophyta	Y	Y	Y	Y	na	Y	Y	Y	N	na	Y	Y
	Chlorophyta	Y	Y	Y	Y	na	Y	Y	Y	N	na	Y	Y
	Rhodophyta	Y	Y	Y	Y	na	Y	Y	Y	N	na	Y	Y
Plantae	Marchantiophyta	Y	na	na	na	na	na	N	N	N	na	na	na
	Bryophyta	Y	na	Y	na	na	na	N	N	N	na	na	na
	Lycopodiophyta	Y	na	na	na	na	Y	N	N	N	na	na	na
	Pteridophyta	Y	na	Y	Y	na	Y	N	N	N	Y	na	na
	Pinophyta	Y	na	Y	na	na	N	N	N	N	na	na	na
	Angiospermae	Y	Y	Y	Y	Y	Y ex T	N	N	N	Y	Y	Y
Fungi	Chytridiomycota	Y	na	na	na	na	na	N	N	N	na	na	na
	Zygomycota	na	na	na	na	na	Y	N	N	N	na	na	na
	Ascomycota	Y	Y	Y	na	na	na	N	N	N	na	na	na
	Basidiomycota	Y	Y	Y	na	na	na	N	N	N	na	na	na
Animalia	Porifera	Y	na	na	na	na	Y	Y	Y	Y	na	Y	Y
	Cnidaria	Y	na	Y	Y	na	Y	Y	Y	Y	na	Y	Y
	Ctenophora	Y	na	Y	na	na	Y	Y	Y	Y	na	Y	na
	Platyhelminthes	Y	na	na	na	na	Y	Y	Y	Y	na	Y	Y
	Rotifera	Y	na	na	na	na	na	Y	Y	Y	na	na	na
	Bryozoa	Y	Y	Y	na	na	Y	Y	Y	Y	na	Y	Y

	Phylum	DAISIE	ISSG	CABI	FAO	NOBANIS	NNSS	Waarnemingen	Waarneming	Naturalis	BFIS	Gollasch et al. (2009)	Wolff (2005)
	Entoprocta	na	na	na	na	na	Y	Y	Y	Y	na	na	na
	Nemertea	Y	na	na	na	na	na	Y	Y	na	na	na	na
	Mollusca	Y	Y	Y	Y	na	Y	Y	Y	Y	na	Y	Y
	Annelida	Y	Y	Y	Y	na	Y	Y	Y	Y	na	Y	Y
	Nematoda	Y	na	Y	na	na	Y	Y	Y	Y	na	Y	Y
	Arthropoda	Y	Y	Y	Y	na	Y ex T	N	N	Y	Y	Y	Y
	Chordata	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Additional 17 sources were used for following groups:

- Angiospermae: Agence de l'eau Artois Picardie and Conservatoire Botanique National de Bailleul (2005), Agence de l'eau Rhin Meuse (2005), Costa (2005), Delbart et al. (2007), Conseil General du Finistere (2008), Lacroix et al. (2008), Paradis et al. (2008), Zambettakis and Magnanon (2008), Reseau regional des Gestionnaires des Milieux Aquatiques Paca (2009), Hudin and Vahrameev (2010), "DAISIE - Delivering Alien Invasive Species Inventories for Europe. 100 of The Worst", "EPPO - European and Mediterranean Plant Protection Organisation. EPPO list of invasive alien plants", "Le Conservatoire Botanique National de Bailleul. Liste des plantes exotiques considérées comme envahissantes en Picardie", "Q-bank. Invasive Plants database. Comprehensive databases on quarantine plant pests and diseases"
- Arthropoda: Rabitsch (2008), Roques et al. (2010), "DAISIE - Delivering Alien Invasive Species Inventories for Europe. 100 of The Worst"
- Heterokontophyta, Chlorophyta, Rhodophyta, Lycopodiophyta, Pteridophyta and Pinophyta: Plantlife (2010)

Furthermore, all volumes of the three journals Neobiota (vol. 9–20), Aquatic Invasions (vol. 1–8) and BioInvasions Records (vol. 1–2 and vol 3 in press articles) available by February 2014 were thoroughly and systematically scanned for relevant studies that potentially provided further information on species' presence in the RINSE countries. This was done by reading the titles and, in case that indicated potential relevance to our database, reading the abstract and complete manuscript. In total, the following 19 studies were thereby included in the registry: Copp et al. (2006), Kerckhof et al. (2007), Sjøtun et al. (2008), Kai and Soes (2009), Wijnhoven and Dekker (2010), Zięba et al. (2010), Vaate and Beisel (2011), Brylinski et al. (2012), Faasse and Giangrande (2012), Marescaux et al. (2012), Faasse (2013a), Faasse (2013b), Heiler et al. (2013), Kessel et al. (2013), Lavesque et al. (2013), Minchin et al. (2013), Pinder et al. (2013), Scalone and Rabet (2013), and Soors et al. (2013).

Finally, apart from collecting basic data on non-native species present in at least one of the four Two Seas region countries, additional presence in the other three countries of concern was checked using the following seven geographic distribution gateways: "GBIF - Global Biodiversity Information Facility. GBIF Data Portal", Hopkins (2012), "Intergovernmental Oceanographic Commission of UNESCO. The Ocean Biogeographic Information System OBIS", "Muséum national d'Histoire naturelle. INPN Inventaire national du Patrimoine Naturel", "NBN - National Biodiversity Network. National Biodiversity Network's Gateway", "NLBIF - Netherlands Biodiversity Information Facility. Data portal of the Dutch national node of the Global Biodiversity Information Facility (GBIF)", and Verloove (2006). This was done for all taxa except those terrestrial Angiospermae and Pinophyta that were listed as present by the DAISIE portal but not by any of the other databases consulted. In the registry, these species are indicated by the phrase "data based solely on DAISIE portal" in the final column (headed "Notes").

After compilation of the database was completed, we checked for errors through the process of blind repetition of data-compilation for 1% of the dataset (i.e. for 34 species or 136 data points (34 species × 4 countries)). This revealed an error rate of 0.007% (i.e. 1 of 136 data points was incorrect).

The present database will be sustained in the future by periodically conducting a systematic literature review on new invasions in the four countries. This could be done, for example, by a Web of Science or Google Scholar search using keyword combinations such as "non-native OR exotic OR invasive AND Britain OR UK OR Netherlands OR France OR Belgium", and/or a systematic scanning of the most relevant journals such as Nebiota, Aquatic Invasions and BioInvasions Records.

4. Project personnel

Principal investigators:

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Data set status and accessibility

A. Status

1. Latest update.
28/02/2014.
2. Metadata status
Metadata are complete.

B. Accessibility

1. Storage location and medium.
Original data files exist on the authors' personal computers in MS Excel® format.
2. Contact Persons
Alexandra Zieritz: alexandra.zieritz@cantab.net
Belinda Gallardo: galla82@hotmail.com
3. Copyright restrictions
None.
4. Proprietary restrictions
None.
b. Citation
Data were provided by the RINSE (Reducing the Impacts of Non-native Species in Europe) project (http://www.rinse-europe.eu/).

Data structural descriptors

A. Data set file

1. Identity
The data set comprises one file (MS Excel® document) named Table_RegistryNonNativeSpecies.xls. The file contains two worksheet:

1.1. The "Registry" worksheet comprises the registry itself, listing all non-native species that were recorded as non-native in at least one of the four countries of the Two Seas region (Great Britain, France, Belgium and Netherlands). For each species, the phylum/division, class, genus and species name, environment, as well as its status in each of the four countries is given.

1.2. The "Summary of data" worksheet provides 3 tables, grouping the non-native species of the registry according to their 1.2.1. Phyla, 1.2.2. Presence in each Two Seas region country, and 1.2.3. Environment inhabited. Three simple graphs visualising these tables are also provided.

2. Size

The size of the file is 389 KB. The table lists 6,661 species, subspecies and hybrids. In total and including headers, the "Registry" worksheet therefore contains 66,620 cells. The "Summary of data" worksheet contains 92 cells.

3. Format and storage mode

The file type is MS Excel®. No compression scheme was employed.

4. Header information

A single header row includes the species' phylogenetic classification (i.e. four headers: phylum/division, class, genus and species name), status in the four countries investigated (i.e. present, native, extinct or not confirmed), environment (i.e. terrestrial, freshwater, marine, freshwater+terrestrial, marine+freshwater or terrestrial+marine), and Notes.

5. Alphanumeric attributes

Alphabetic character fields.

B. Variable information

1. Variable identity	2. Variable definition	3. Units of measure-ment	4a. Storage type	4b. List and definition of variable codes
Phylum / Division	Taxonomic phylum or division of species	N/A	Character	N/A
Class	Taxonomic class of species	N/A	Character	incertae sedis - taxonomic placement currently unresolved
Genus	Genus name	N/A	Character	N/A
Species	Species name	N/A	Character	sp. - taxon not identified to species level
Great Britain	Status of species in Great Britain	N/A	Character	extinct - non-native species was present in the wild in GB/France/Belgium/Netherlands at some time but is no longer present in the respective country native - species native to GB/France/Belgium/Netherlands not confirmed - presence of non-native species not confirmed for GB/France/Belgium/Netherlands present - non-native species has been recorded in the wild in GB/France/Belgium/Netherlands and is likely to exist there at this time present/extinct - non-native species listed as "present" by one source but as "extinct" by another source present/native - non-native species listed as "present" by one source but as "native" by another source
France	Status of species in France	N/A	Character	
Belgium	Status of species in Belgium	N/A	Character	
Netherlands	Status of species in the Netherlands	N/A	Character	
Environment	Environment(s) inhabited by species	N/A	Character	N/A
Notes	Additional notes to data source	N/A	Character	data based solely on DAISIE portal - taxon listed as present by the DAISIE portal but not by any of the other databases consulted; no additional portal was consulted regarding geographical distribution (also see Methods section)

5. Data format

a. Columns Start column, end column

Start column = Phylum/Division, End column = Notes

Acknowledgements

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Supplementary material 1

Registry of non-native species in the Two Seas region countries (Great Britain, France, Belgium and the Netherlands)

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Data type: occurrence

Explanation note: The MS Excel file contains two worksheets:

1. The "Registry" worksheet comprises lists 661 non-native species that were recorded as non-native in at least one of the four countries Great Britain, France, Belgium and the Netherlands. For each species, the phylum/division, class, genus and species name, environment and status in each country is given.
2. The "Summary of data" worksheet provides 3 tables, grouping the non-native species of the registry according to their phyla, presence in each country, and environment inhabited. Three simple graphs visualising these tables are also provided.

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